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For: **DISK MODULE OF SOLID STATE**

**VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY STATUS  
[37 CFR 1.9(f) & 1.27(b)] - SMALL BUSINESS CONCERN**

I hereby declare that I am:

☐ the owner of the small business concern identified below:

☒ an official of the small business concern empowered to act on behalf of the concern identified below:

NAME OF SMALL BUSINESS CONCERN: POWER QUOTIENT INTERNATIONAL CO., LTD.

ADDRESS OF SMALL BUSINESS CONCERN: 14F, No. 16, Jian-Ba Road, Chung Ho City, Taipei Hsien, Taiwan.

I hereby declare that the above-identified small business concern qualifies as a small business concern as defined in 13 CFR 121.3-18, and reproduced in 37 CFR 1.9(d), for purpose of paying reduced fees under Sections 41(a) and 41(b) of Title 35, United States Code, in that the number of employees of the concern, including those of its affiliates, does not exceed 500 persons. For purpose of this statement, (1) the number of employees of the business concern is the average over the previous fiscal year of the concern of the persons employed on a full-time, part-time or temporary basis during each of the pay periods of the fiscal year, and (2) concerns are affiliates of each other when either, directly or indirectly, one concern controls or has the power to control the other, or a third-party or parties controls or has the power to control both.

I hereby declare that rights under contract or law have been conveyed, to and remain with the small business concern identified above with regard to the invention described in the above-captioned:

☐ PATENT

☒ APPLICATION

If the rights held by the above-identified small business concern are not exclusive, each individual, concern or organization having rights to the invention is listed below\* and no rights to the invention are held by any person, other than the inventor, who could not qualify as a small business concern under 37 CFR 1.9(d) or by any concern which would not qualify as a small business concern under 37 CFR 1.9(d) or a non-profit organization under 37 CFR 1.9(e).

\*NOTE: Separate verified statements are required from each named person, concern or organization having rights to the invention averring to their status as small entities (37 CFR 1.27)

FULL NAME \_\_\_\_\_  
ADDRESS \_\_\_\_\_  
☐ INDIVIDUAL ☐ SMALL BUSINESS CONCERN ☐ NON-PROFIT ORGANIZATION

FULL NAME \_\_\_\_\_  
ADDRESS \_\_\_\_\_  
☐ INDIVIDUAL ☐ SMALL BUSINESS CONCERN ☐ NON-PROFIT ORGANIZATION

I acknowledge the duty to file, in this application or patent, notification of my change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate [37 CFR 1.28(b)].

NAME OF PERSON SIGNING Mei Yuch LU  
TITLE OF PERSON OTHER THAN OWNER President  
ADDRESS OF PERSON SIGNING 14F, No. 16, Jian-Ba Road, Chung Ho City, Taipei Hsien, Taiwan.

DATE Sept. 21, 2000

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## **DISK MODULE OF SOLID STATE**

### **BACKGROUND OF THE INVENTION**

#### 1. Field of The Invention:

The present invention relates to a disk module of solid state, and  
5 particularly to a disk module made of flash memory by way of a solid state process.

#### 2. Description of Related Art:

Conventionally, the memory used in a computer is a memory module  
made of dynamic random access memories (DRAM). A specific feature of  
10 the DRAM is that the data stored in the DRAM will disappear completely as long as the power source is off. Hence, the DRAM can merely offer a temporary storage for data and a hard disk is often applied as a storage device once the data has to be saved after the power source is off. Thus, the hard disk becomes one of typical peripherals of a personal computer.

15 As a data storage device, the hard disk comprises a magnetic disk set of high rotation speed bearing data thereon and a plurality of magnetic heads reading the data on the magnetic disk set. Because it is difficult to prevent the hard disk from a vibration effect, a bottleneck of the hard disk is the portability thereof. Besides, there is no standardized design specification for  
20 the hard disk such that it is very difficult to design a push-pull type of hard disk.

Moreover, a recent development of the hard disk aims at a high storage capacity and results in a hard disk of low storage capacity being produced less gradually. But, it is conceivable that a low storage capacity is  
25 enough for certain specific applications so that a hard disk of high storage capacity is not proper and is excessive.

As for flash memory, it offers a feature that the data saved therein can be kept not removed at the time of power source being off. Thus, a module of flash memory is produced instead of that of DRAM in case of the data being necessary in a state of saving all the way. Accordingly, the flash memory is  
5 another choice of data storage.

At present, a module of flash memory is used to support ISA interface standard, but it is not compatible with IDE interface hard disk. Therefore, it is unable for the flash memory to substitute the hard disk such that the module of flash memory is specially made to support IDE interface for specific  
10 purposes other than hard disk. Hence, it is the reason why the popularity of the module of flash memory is quite limited till now.

### **SUMMARY OF THE INVENTION**

An object of the present invention is to provide a disk module of solid state, which is a module of flash memory by way of solid state process  
15 associated with a standardized IDE interface slot, such that data can be stored therein in spite of power source being off.

### **BRIEF DESCRIPTION OF THE DRAWINGS**

The present invention can be more fully understood by referring to the following description and accompanying drawing, in which:

20 Fig. 1 is a plan view of a solid state disk module in accordance with the present invention;

Fig. 2 is a circuit diagram of a flash memory controller and a IDE interface in an embodiment of the present invention;

Fig. 3 is a circuit diagram of a flash memory array;

25 Fig. 4 is a perspective view illustrating the solid state disk module of the present invention in a state of vertical engagement;

Fig. 5 is a perspective view illustrating the solid state disk module of the present invention in a state of horizontal engagement at left; and

Fig. 6 is a perspective view illustrating the solid state disk module of the present invention in a state of horizontal engagement at right.

5    **DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS**

Referring to Figs. 1, basically, a disk module of solid state according to the present invention comprises a IDE interface **1**, a power source **2**, a flash memory controller **3**, and a flash memory array **4**.

10    The IDE interface **1** is a connector provided with engaging pins and the number of the engaging pins can be variable for engaging with a disk interface on a computer. For instance, the IDE interface **1** may be adopted a standard connector normally used in computer industry such as forty connecting pins or forty-four pins. When a IDE interface of forty-four pins is applied, the power source **2** can be connected with four pins therein directly  
15    and it is not required an external connector for the power source. The IDE interface **1** is located at a side of a casing of solid state disk module **B**.

20    The power source **2** offers working voltage required by the flash memory controller **3** and the flash memory array **4**. As mentioned above, four connecting pins in the IDE interface of forty-four pins are used to connect with the power source **2**. However, external connector pins have to be provided additionally to connect with the power source **2** in case of the IDE interface of forty pins being adopted as shown in Fig. 4, 5, and 6.

25    The flash memory controller **3** is preferably a single chip controller to control data access and to specify an address for data storage. Therefore, the flash memory controller **3** has a circuit to connect with IDE interface **1**. In practice, MX9691 single chip controller as shown in Fig. 2 can be applied

as the flash memory controller **3** and this is an prior art such that there is no further detail will be described here.

The flash memory array **4** is composed of banks of flash memories and is used for saving data. As shown in Fig. 3, ten flash memories are divided into five banks (bank 0 to bank 4). It is noted that Fig. 3 is an example only not a restriction. The flash memory array **4** also has a circuit to connect with the flash memory controller **3**. In this way, a memory module is formed. It is noted that this is a prior art and a further detail will not be described.

As for the hardware, Figs. 4, 5, and 6 show the flash memory controller **3** and the flash memory array **4** are provided on a printed circuit board **A** and enclosed by a casing **B**. The IDE interface **1** exposes outside the casing **B** to ease engaging job.

Referring to Fig. 4, IDE interface **1** has the same orientation as the casing **B** such that the IDE interface **1** can vertically engage with a disk connecting interface on the computer to save a horizontal space as the way has been mentioned above does. If the IDE interface of forty pins is used, the power source **2** is separate from the casing **B** to avoid occupying original connecting pins and provided with a power input terminal **21** and a power output terminal **22** to receive input power and send out power respectively. If the IDE interface of forty-four pins is used, the four pins therein can be utilized as power source and no additional power source **2** is necessary.

Referring to Fig. 5, the connecting interface of the hard disk is located at the left side of the main board. The IDE interface **1** is disposed vertically under both of the casing **B** and the circuit board **A**. In this way, the space along the height of the main board will not be occupied and other parts will not be affected. The power source **2** can be externally connected or not depending on the number of connecting pins on the IDE interface **1**. In order to avoid an unnecessary space occupation, an end face of the IDE has

an extending interface **11** with connecting pins for an external engagement. The IDE interface **1** and the extending interface **11** may engage with each other by way of pins and holes arrangement or vise versa.

Referring to Fig. 6, a further embodiment of the present invention is illustrated and it is similar to the embodiment shown in Fig. 5. The embodiment of Fig. 6 is different from that in Fig. 5 in the orientation and it is used to fit with a connecting interface of hard disk located at right side of the main board. Therefore, after engagement, the right side of the main board extends outwards such that the space along the height thereof is not occupied and it is not possible to affect the internal arrangement of the main board.

It is noted that the flash memory disk module of the present invention overcomes a restriction that the flash memory has to be actuated by way of the ISA interface standard. Furthermore, comparing the hard disk, the flash memory disk module provides a more superior feature of decay resistance, has a smaller dimension, saves much more power, offers saved data in a state of permanent storage, is a more appropriate data storage device for requiring carrying data at hand, and is compatible with the disk connecting interface on any personal computer. Therefore, it is appreciated that the flash memory disk module of the present invention is a great innovation regarding the data saving absolutely.

While the invention has been described with reference to preferred embodiments thereof, it is to be understood that modifications or variations may be easily made without departing from the spirit of this invention, which is defined by the appended claims.



**WHAT IS CLAIMED IS:**

1. A disk module of solid state, comprising  
a IDE interface, being a connector to engage with the main board of a computer;  
5 a flash memory controller, being used to control data access and specify an address of data storage;  
a power source, being connected to said flash memory controller to supply a working voltage; and  
a flash memory array, being composed of a plurality of flash memories  
10 and connecting with said flash memory controller for saving data.
2. A disk module of solid state as defined in claim 1, wherein said power source may be associated with the IDE interface to form a connector.
3. A disk module of solid state as defined in claim 1, said flash memory controller is a single chip controller.
- 15 4. A disk module of solid state as defined in claim 3, wherein said single chip controller is MX9691 controller.
5. A disk module of solid state as defined in claim 1, wherein said flash memory array are ten flash memories dividing into five groups.
6. A disk module of solid state as defined in claim 1, wherein said flash  
20 memory controller and said flash memory array are disposed on a circuit board.
7. A disk module of solid state as defined in claim 1, wherein said flash memory controller and said flash memory array are covered by a casing and a side thereof connects a IDE interface.
- 25 8. A disk module of solid state as defined in claim 1, wherein the power source extends a power output.

9. A disk module of solid state as defined in claim 7, wherein the IDE interface has the same orientation as the casing for a vertical engagement.

10. A disk module of solid state as defined in claim 7, wherein the IDE interface is disposed to perpendicular to the casing for a horizontal engagement.

11. A disk module of solid state as defined in claim 1, wherein the IDE interface is integral with an extending interface.

**ABSTRACT OF THE DISCLOSURE**

5 A disk module of solid state is comprised of a IDE interface, a flash memory controller, a power source, and a flash memory array. The IDE interface is a connector to engage with the main board of a computer. The flash memory controller is used to control data access and specify an address of data storage. The power source is connected to the flash memory controller for supplying a working voltage. A flash memory array is composed of a plurality of flash memories and connecting with the flash memory controller for saving data.

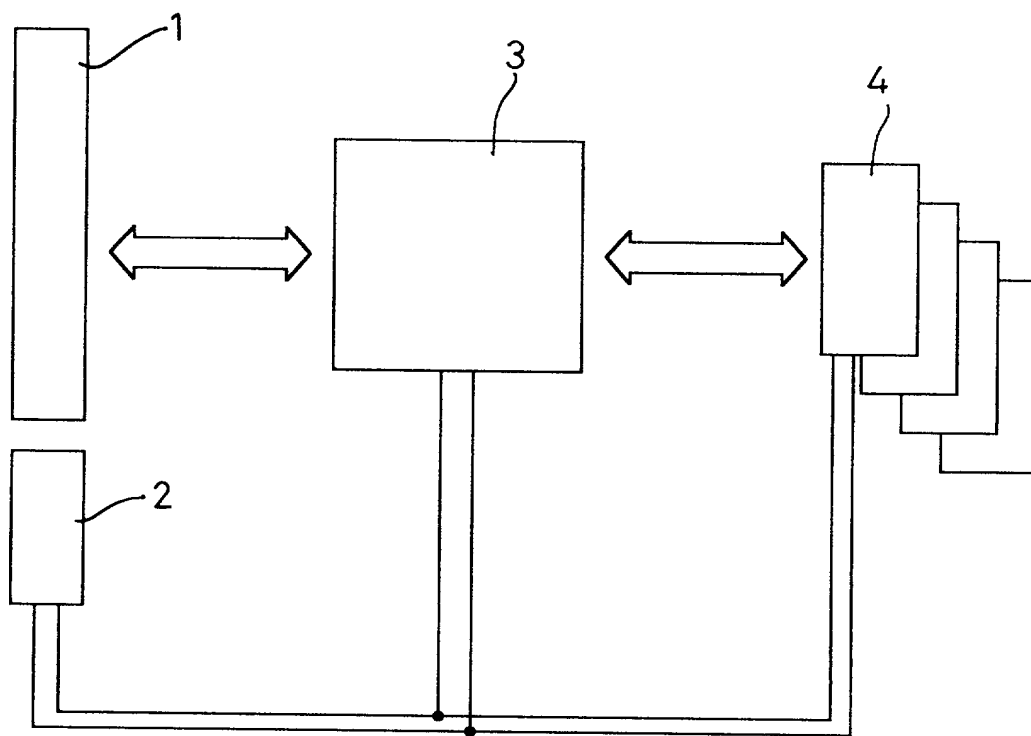


FIG. 1

FIG. 2

3  
FIG.

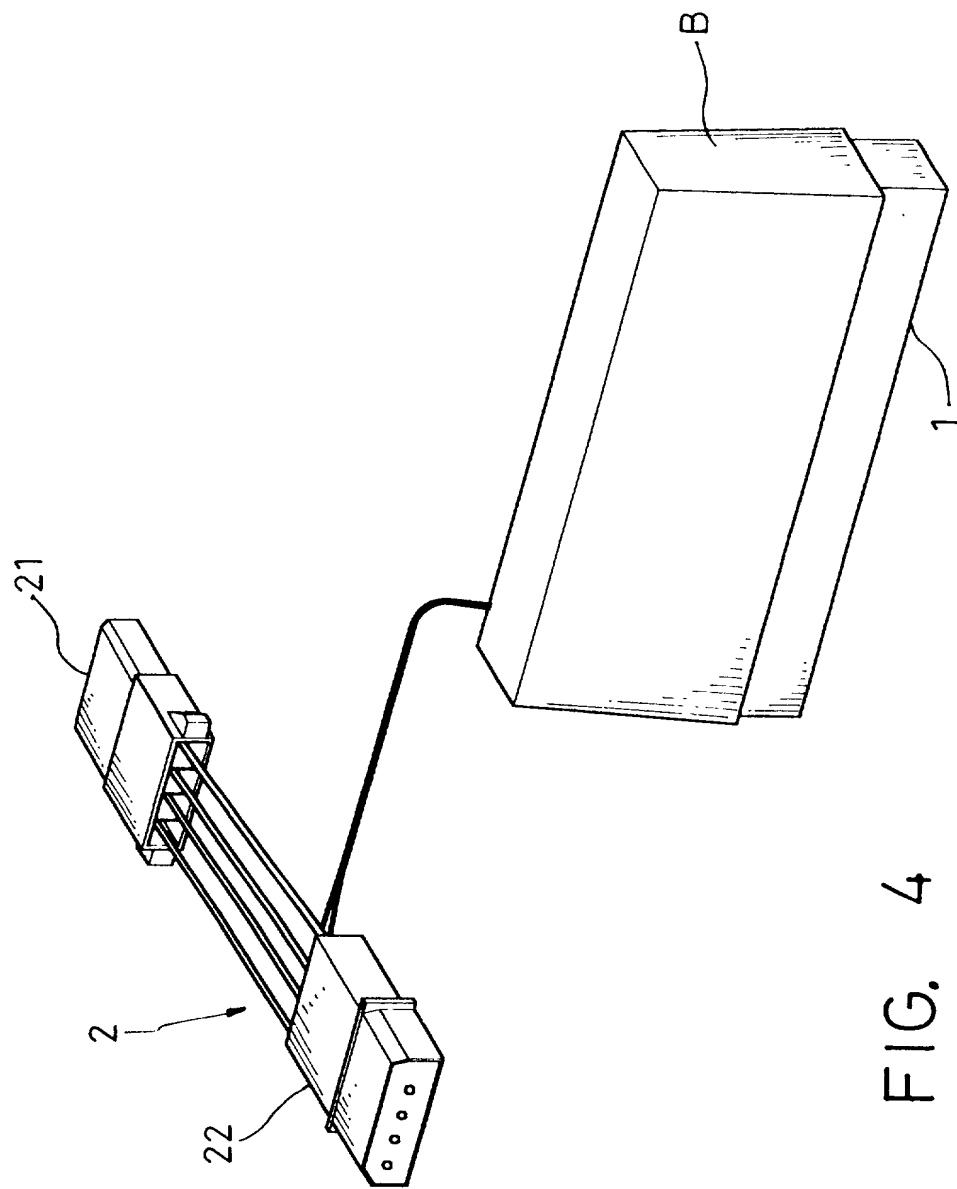
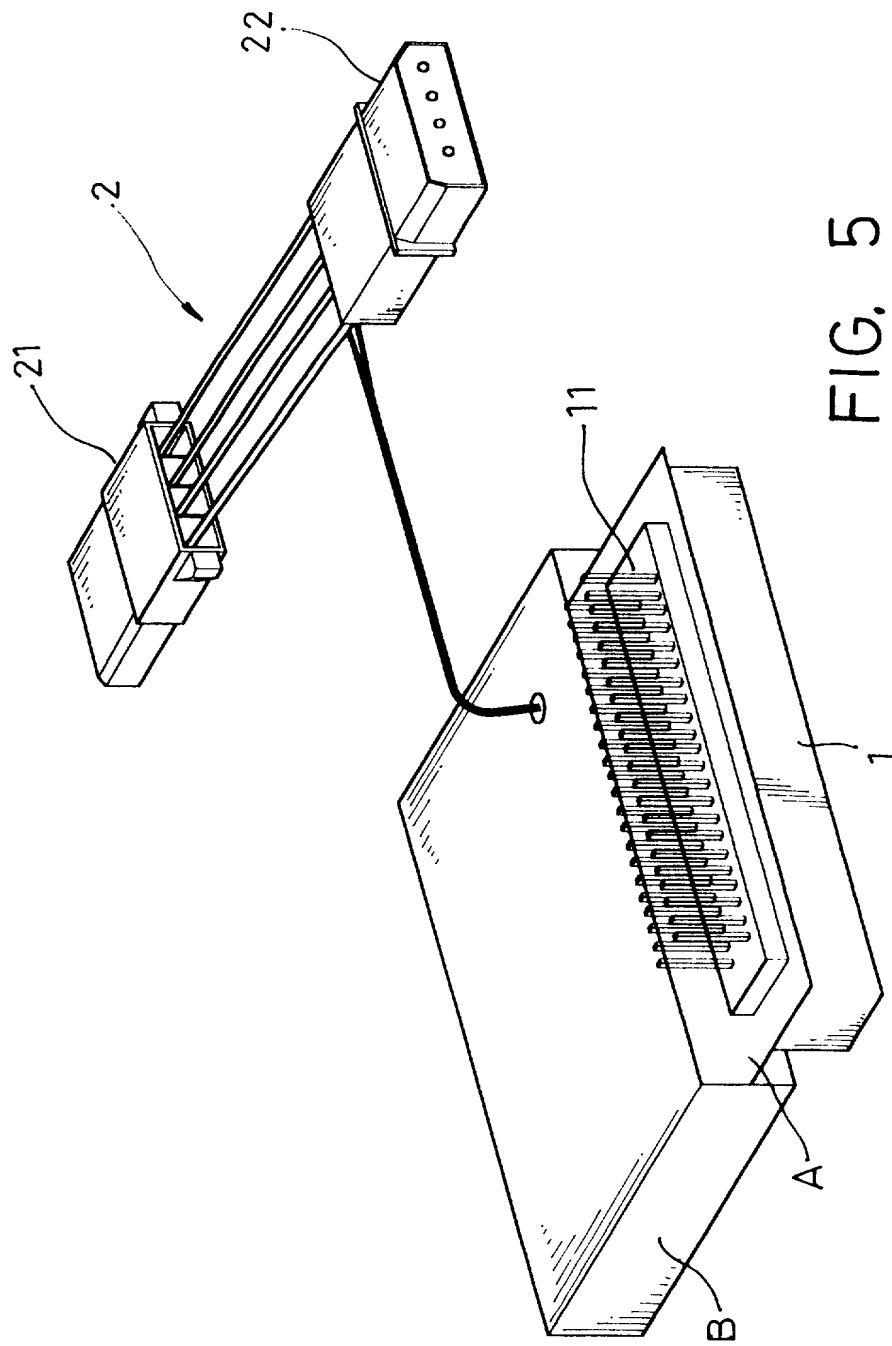


FIG. 4





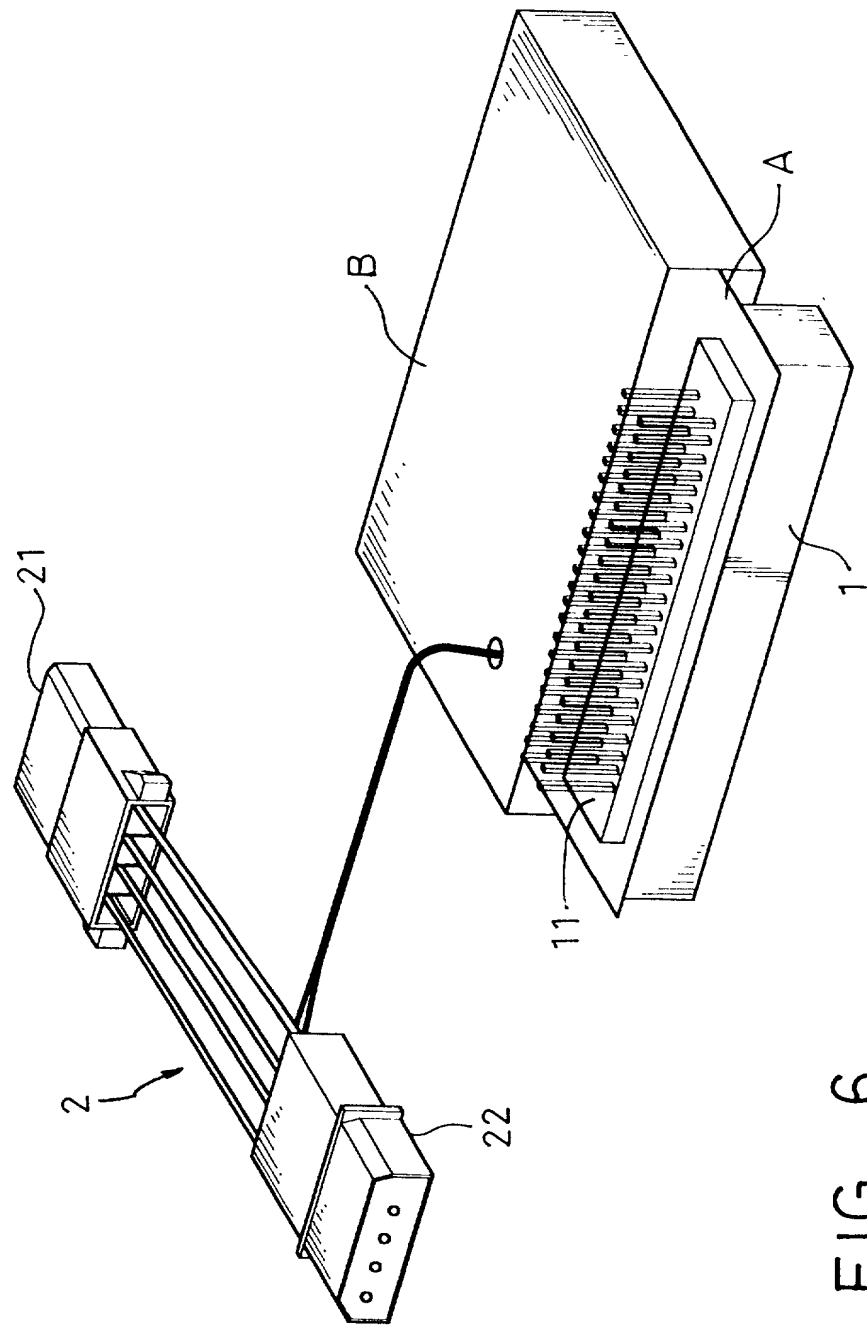


FIG. 6

**DECLARATION FOR PATENT APPLICATION AND APPOINTMENT OF ATTORNEY**

As a below named inventor, I hereby declare that my residence, pose office address and citizenship are as stated below next to my name. I believe that I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention (Design, if applicable) entitled:

**DISK MODULE OF SOLID STATE**

the specification of which (check one)

☒ is attached hereto.

and (if applicable) was amended on:

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment(s) referred to above. I acknowledge the duty to disclose information which is material to patentability as defined in *Title 37, Code of Federal Regulations, Sections 1.56*. I hereby claim foreign priority benefits under *Title 35, United States Code, Sections 119* of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed.

<b>Prior Foreign Application(S)</b>			<b>Priority Claimed</b>	
<b>Number</b>	<b>Country</b>	<b>Day/Month/Year Filed</b>	<b>Yes</b>	<b>No</b>

☐ Additional Priority Application(s) Listed on Following Page(s)

<b>I Hereby Claim The Benefit Under Title 35, U.S. Code, Sections 119(E) of Any U.S. Provisional Applications Listed Below.</b>	
<b>Application Number</b>	<b>Day/Month/Year Filed</b>

☐ Additional Priority Application(s) Listed on Following Page(s)

I hereby claim the benefit under *Title 35, United States Code, Sections 120* of any United States application(s) or PCT international application(s) designating The United States of America listed below and insofar as the subject matter of each of the claims of this application is not disclosed in that/those prior application(s) in the manner provided by the first paragraph of *Title 35, United States Code, Sections 112*, I acknowledge the duty to disclose information which is material to patentability as defined in *Title 37, Code of Federal Regulations, Sections 1.56* which became available between the filing date of the prior application(s) and the national or PCT international filing date of this application:

<b>Application Number</b>	<b>Filing Date</b>	<b>Status-Patented, Pending or Abandoned</b>
09/236,398	Jan. 25, 1999	Pending

☐ Additional Priority Application(s) Listed on Following Page(s)

I hereby declare that all statements made herein of my own knowledge are true and all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

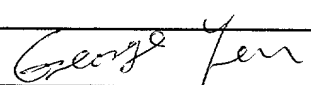
**POWER OF ATTORNEY:** I (We) hereby appoint as my (our) attorneys, with full powers of substitution and revocation, to prosecute this application and transact all business in the United States Patent and Trademark Office connected therewith:

**David E. Dougherty Registration No. 19,576 and Bruce H. Troxell Registration No. 26,592**

I (We) authorize my (our) attorneys to accept and follow instructions from XINO INTERNATIONAL INTELLECTUAL PROPERTY OFFICE regarding any matter related to the preparation, examination, grant and maintenance of this application, any continuation, continuation-in-part or divisional based thereon, and any patent resulting therefrom, until I (we) or my (our) assigns withdraw this authorization in writing.

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<b>Date</b>	Sept, 21, 2000	<b>Signature</b>	

☐ See following page(s) for additional joint inventors.